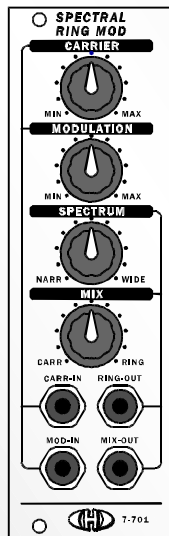


Modular system

Spectral

Ring Modulator

Module 7-701 v. 1.0



USER GUIDE





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This manual and other documentation are also available at : www.chd-el.cz

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1. MAIN FEATURES

- ❑ Processing of both AC and DC input signals
- ❑ Spectrum control for feedback modulation
- ❑ Mixed output with “Dry / Wet” audio signal ratio control
- ❑ Carrier and Modulator input level controls
- ❑ Limiters on both Carrier and Modulator inputs
- ❑ Stainless steel front panel
- ❑ Pure analogue circuitry (no DSP technology used)
- ❑ Fully hand-made - each module tested and adjusted individually



OUR MISSION

Do things different

Always offer something unique and innovative not available on the market so far.

No compromises in the circuitry design

Don't give up the sound quality for cost driven compromises.

Classic design and hi-end components

For long live and better serviceability of the devices.

Hand made in Europe

Each unit is hand made and individually adjusted for highest quality control.

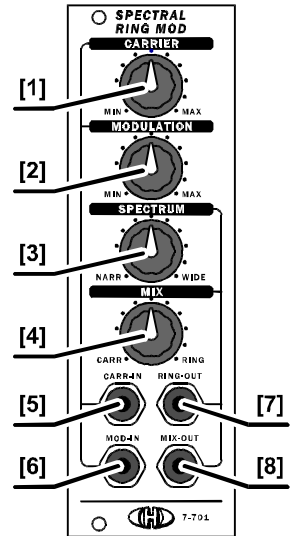


2. MODULE FUNCTIONS

Spectral Ring Modulator is module designed for Eurorack modular synthesizer systems. All controls, signal inputs and outputs are located on the front panel (see Fig. 1). Inputs and outputs use standard mono 3,5 mm (1/8") mini-jack patch connectors.

Fig. 1 - Module front panel

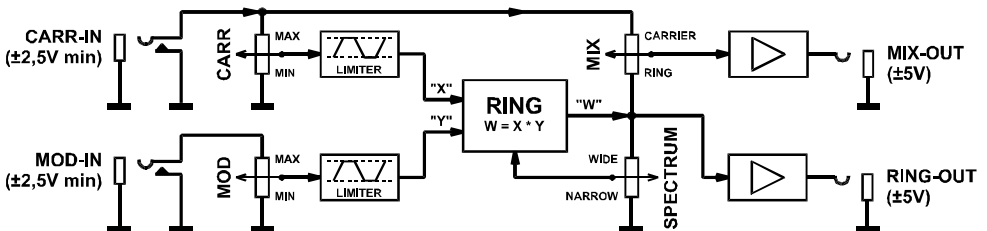
- [1] CARRIER - carrier signal input CARR-IN level control
- [2] MODULATION - modulation signal input MOD-IN level control
- [3] SPECTRUM - side frequency signal input level control
- [4] MIX - ratio of direct signal from CARR-IN input and processed signal from RING-OUT output at MIX-OUT output
- [5] CARR-IN - audio or modulation signal input (Carrier)
- [6] MOD-IN - audio or modulation signal input (Modulator)
- [7] RING-OUT - ring modulator output
- [8] MIX-OUT - mixed output



The Ring modulator module is usually used for metallic or bell-like sounds. Optimal result depends on the module controls settings.

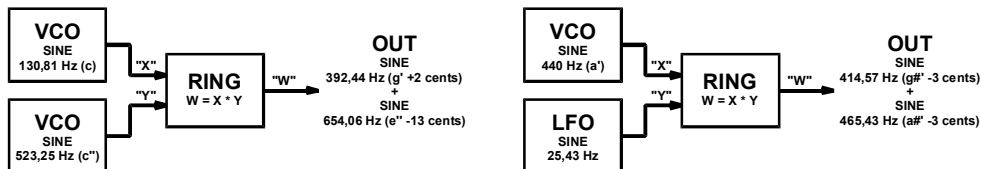
Spectral Ring Modulator is based on pure analogue signal multiplier. The scheme in Fig. 2 shows the internal block structure of the module.

Fig. 2 - Block scheme



Spectral Ring Modulator function is fully four-quadrant multiplication of the analogue signals from CARR-IN [5] (CARRIER - carrier signal input with f_{CARR} frequency) and MOD-IN [6] (MODULATION - modulation signal input with f_{MOD} frequency). The result of this operation are two, so called, side bands (new frequencies $f_{CARR} + f_{MOD}$ and $f_{CARR} - f_{MOD}$) and subsequent cancellation of the original frequencies (f_{CARR} and f_{MOD}) - see Fig. 3.

Fig.3 - Examples of side bands creation

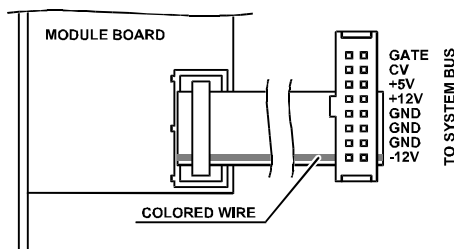


3. CONNECTION THE MODULE TO THE SYSTEM

To connect the module, plug carefully the supplied ribbon cable into the bus socket of your modular case. **The colored marking of the ribbon cable must be at the bottom of the bus connector!** Failure to check this may result in the module or case PSU damage! (module is not protected against permanent incorrect polarity).

The module uses $\pm 12V$ of the system only (pins Nr. 1 to 10), GATE, CV and +5V signals are not used (see Fig. 4).

Fig. 4 - Bus board connection



4. OPERATION

Both CARR-IN [5] and MOD-IN [6] inputs can process signals in the frequency range of 0 to 20 kHz (i.e. DC signals can be processed too). The input level of both signals is controllable by CARRIER [1] (for CARR-IN [5] input) and MODULATION [2] (for MOD-IN [6] input). Minimal input level for optimal signal processing is $\pm 2,5 V_{PP}$ (both pots are in the most right position - MAX in that case).

Both ring modulator inputs "X" and "Y" are equipped with limiter (see Fig. 2) - signals with input levels higher than the multiplier can process are limited. In this case, certain distortion appears that might be used for another special sound effects. When the signal is limited, the next new harmonic frequencies are created.

Spectral Ring Modulator module is equipped with two audio signal outputs RING-OUT [7] and MIX-OUT [8]. Both outputs provide signal with amplitude of max. $\pm 5 V_{PP}$ (accordingly to the front panel controls settings).

RING-OUT [7] output provides direct output from analogue multiplier (see Fig. 2).

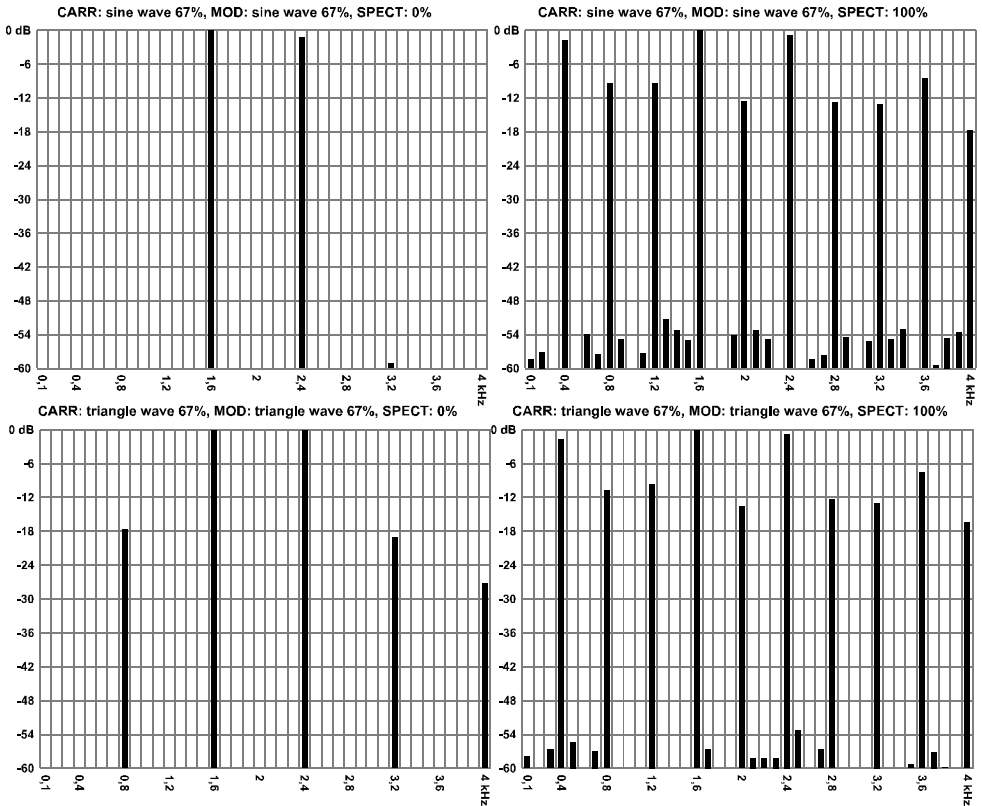
MIX-OUT [8] output provides the mixed signal of analogue multiplier and dry CARR-IN [5] input signal (see Fig. 2). The "Dry/Wet" signals ratio can be set by MIX [7] potentiometer. In its most left (CARR) position, MIX-OUT [8] output provides only the dry CARR-IN [5] input signal. In its most right (RING) position, MIX-OUT [8] output provides only resulting multiplied signal.



5. HARMONIC FREQUENCIES SPECTRUM CONTROL

Spectral Ring Modulator module is equipped with special feedback function with level controlled by SPECTRUM [3] potentiometer. This feature can create additional harmonic frequencies. In its most left position (NARROW) the ring modulator creates only basic side frequencies ($f_{CARR} + f_{MOD}$ and $f_{CARR} - f_{MOD}$), while in its most right position (WIDE) the maximum possible spectrum of harmonic frequencies is created. The following charts on Fig. 5 depict the signal spectrum at RING-OUT output for frequencies 2 kHz (CARR-IN) and 400 Hz (MOD-IN).

Fig. 5 -SPECTRUM regulator settings results





6. TECHNICAL PARAMETERS

Mechanical dimensions

Module width : 8 HU (40,3 mm)
Module height : 3 U (128,5 mm)
Module site depth : 35 mm (without power supply cable)

Power supply

Supply voltage : ± 12 V from the system bus
Current requirement : max +15 mA / +12 V
max -15 mA / -12 V

Inputs / outputs

Inputs : CARRIER \rightarrow min $\pm 2,5$ V_{PP} for full driving / Z_{IN} = 10 k Ω
MODULATION \rightarrow min $\pm 2,5$ V_{PP} for full driving / Z_{IN} = 10 k Ω
Outputs : RING \rightarrow max ± 5 V_{PP} / Z_{OUT} = 200 Ω
MIX \rightarrow max ± 5 V_{PP} / Z_{OUT} = 200 Ω

Accessory

Ribbon power supply cable with 10 / 16 pin connectors, length ca 200 mm

7. WARRANTY CONDITIONS

The equipment is provided with **thirty-month warranty** starting from the date of the equipment take-over by the customer. This date must be specified on warranty list together with dealer's confirmation. During this period of time, all defects of equipment or its accessories, caused by defective material or faulty manufacturing, will be removed free of charge. Warranty repair is asserted by the customer against the dealer. Warranty period is to be extended for the time period, during which the product was under the warranty repair. The relevant legal regulations take effect in case of cancellation of purchase contract.

The customer will lose the right for free warranty repair, if he will not be able to submit properly filled out warranty list or if the defects of the product had been caused by:

- unavoidable event (natural disaster),
- connecting the device to the incorrect supply voltage,
- inputs or outputs overloading by connecting the signals source or load source with not-corresponding characteristics etc.,
- faulty equipment operation, which is at variance with the instructions referred-to in the operating manual,
- mechanical damage caused by consumer during transportation or usage of equipment,
- unprofessional interference with the equipment or by equipment modification without manufacturer's approval.

